THE WALL STREET JOURNAL. ONLINE
March 28, 2016

Testing to Start for Computer With Chips Inspired by the Human Brain

$1 million computer has 16 IBM microprocessors designed to mimic the way the brain works

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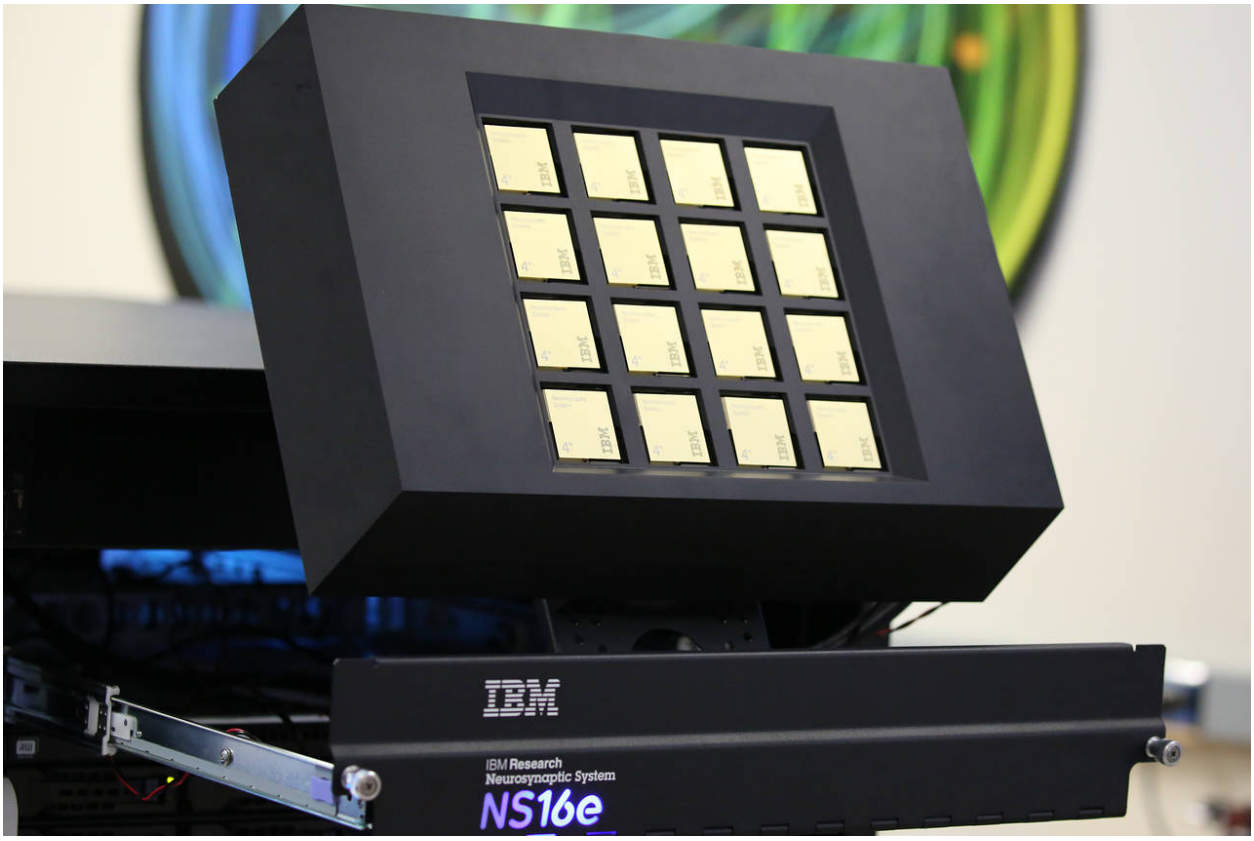

Lawrence Livermore National Laboratory will test this computer built by IBM using 16 specialized chips inspired by the workings of the human brain. Photo: IBM

To solve some of the world's toughest computing problems, **Lawrence Livermore National Laboratory** is getting a boost from the human brain.

The U.S. government lab will begin testing on Thursday a $1 million computer, the first of its kind, packed with 16 microprocessors that are designed to mimic the way the brain works.

The chip called TrueNorth, introduced by International Business Machines Corp. in 2014, is radically different from the microprocessors found in today's servers or personal computers. It is packed with 5.4 billion transistors that constitute a network of one million simulated neurons connected by a vast web of synapses.

IBM joins companies including Qualcomm Inc. and Microsoft Corp. in devising specialized chips designed to speed up some complex computational tasks. Chips such as TrueNorth are better suited to the artificial intelligence technique known as deep learning, which also is based loosely on how the brain operates.

“Brains, somehow, despite fairly simple-looking components, are able to solve some very complex problems,” said Dharmendra Modha, an IBM fellow who began work on TrueNorth nearly 12 years ago.

IBM says it will be five to seven years before TrueNorth sees widespread commercial use, but the Lawrence Livermore test is a big step in that direction.

Like the human brain, TrueNorth doesn’t burn a lot of energy. A server chip typically consumes upward of 150 watts; 16 TrueNorth chips, just 2.5 watts.

But TrueNorth couldn’t run a Web server or even write columns in an Excel spreadsheet. It is designed to enable next-generation tasks such as image recognition or the kind of smarts that recently enabled Alphabet Inc. ’s artificial-intelligence program AlphaGo to defeat a Go grandmaster in South Korea.

“TrueNorth is useful for deep-learning applications and for a broader class of machine-learning applications as well,” said Brian Van Essen, a computer scientist at Lawrence Livermore.

Lawrence Livermore, located in Livermore, Calif., has been evaluating TrueNorth since late 2014, but the 16-microprocessor machine is its first opportunity to run large-scale tests, Mr. Van Essen said. Mr. Van Essen’s team will unload some supercomputing tasks to TrueNorth, similar to the way a personal computer uses a specialized graphics processing unit to draw images on a computer’s screen.

He expects the technology to help the lab weed out potential glitches in simulations of phenomena such as subatomic particle interactions and spot patterns in cybersecurity and video surveillance.

The 16-processor Lawrence Livermore machine is an important test of IBM’s TrueNorth technology, according to Luis Ceze, an associate professor of computer science at the University of Washington.

“It’s great that they’re doing this,” he said. “It’s very efficient, but they have to show that the accuracy of the models that they implement [is] good enough.”

Big Blue isn’t the only company trying to build processors that excel at deep learning. Qualcomm is working on a similar chip called Zeroth. Microsoft researchers are experimenting with programmable processors designed to work with the company’s Bing search engine.

Doug Burger, the researcher leading Microsoft's efforts, sees these chips popping up inside everything from large data centers to cars as companies look for ways to accelerate the performance of their machine-learning algorithms.

"The race to get to the new architecture of this era is on," IBM's Mr. Modha said. "And, frankly, we're leading."

Corrections & Amplifications:
A server chip typically consumes upward of 150 watts; 16 of International Business Machines Corp.'s TrueNorth chips, just 2.5 watts. An earlier version of this article incorrectly stated a single TrueNorth chip consumes 2.5 watts. (March 28, 2016)